FABRICATION AND USE OF INSTRUCTIONAL MATERIALS SOURCED FROM RE-CYCLED PLASTIC

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Abstract

This paper focused on the Fabrication and Use of Instructional Materials Sourced from Re-Cycled Plastics. The paper reviewed literature on plastics and provided basis for need to use Plastic Collage instead of marker/cardboard and charts. Four research questions were answered and one hypothesis was generated for the study. A pre-test post-test randomized design was used. The instrument used is a validated social studies test administered on the two set of students on whom the instructional material was used. Data was analyzed using ANOVA. Findings revealed that students taught using the plastic collage performed better than those on whom cardboard charts were used. It is recommended that teachers should be encouraged to design and develop their own materials using simple and easy to fabricate re-cycled plastics.

Keywords: Fabrication, Instructional materials, Re-cycled, Plastic

Introduction

The use of instructional materials for the teaching of art in junior secondary school over the years have been streamlined, cardboard drawings outlined with felt pens have been over used so much that they no longer have improved performance effect on the students (Benedict, 1988). In addition, too much emphasis had been placed on the use of instructional materials made out of wood, Paper Mache, and sometimes clay and other ceramic wares which are beginning to reflect boredom in students (Olumorin, 1994). It is in view of these that it has become necessary to explore other medium of production of instructional materials such as plastic.

Plastic, a name derived from a Greek word "*plastikos*" which literarily mean "to form" is a long chain of repeating units from several chemical bonds built-up from giant molecules known as polymer (Seymor, 1975). Since the first commercial production of plastic in 1868, it has been put to various uses ranging from automobile parts, mechanical, biomedical, and electrical and even in domestic spheres. It is apparent that plastic only found its way into the educational sphere in the area of production of ball points, blackboard, and table rulers, and other mathematical instruments all of which are of course factory produced.

Taking into cognizance, therefore, Tickton (1970)'s definition of educational technology, where he state "A systematic way of designing, carrying out and evaluations the total process of learning in terms of specific objectives based on research of human and non-human resources to bring about more effective instruction" (p.7) one would not, but give the use of plastic special consideration as a medium of producing instructional material, considering its special qualities of ability to liquefy, when heated, and return to solid state after cooling. It is light in weight by nature, non-corrosive and easy to fabricate with locally available materials and tools. In

addition, since learning system is, according to Davies (1974) "...an organized combination of people materials facilities, equipment and procedure which interact to achieve a goal" (p.64), an idea of combines human creativity of a collage in plastic through the use of locally available tools equipment, and the utmost goal of achieving, informed the basis for this research work.

Contextual Clarification of Major Terms

Plastic: A synthetic product of several chemical compounds that are capable of liquefying when heated and returning to solid state when cooled.

Collage: Pasting of different forms and fashions of shapes cut from plastic as a medium and gumming of such shapes and forms on a flat surface to create aesthetic illusion.

Aesthetic: An optical illusion of recognizing and appreciating beauty.

Instructional Material: It is a carefully designed and fashioned material, made out of specific medium/media for the purpose of simplifying teaching.

The Plastic Collage Instruction Material

Plastic collage is a unit of instructional package that can also serve as a decorative material. It is composed of three parts, which are the background plastic, the moulded and fashioned overlays and the frame unit. These three parts cannot be used in isolation as it is the combination of all that forms the basic package that can be termed as functional.

The background is a single sheet of plastic; its measurement depends strictly on the patterns of the design intended. In situations where the designs are fashioned to extend horizontally, the background plastic is positioned to have its length laid horizontally; this form of positioning is referred to as "Landscape" while the situation whereby the background stands upright i.e. with the longest end upright is called the "Portrait" position. As earlier mentioned this positioning is determined by the initial design of the work.

The Second part the collage is the moulded and fashioned overlays. The moulded plastics are the major shapes that form the foundation of the whole collage; they come in large pieces specifically shaped to take the resemblance outline of the intended picture for the collage.

For instance, the collage is designed to teach the major traditional dresses in Nigeria, taking Fulani cattle rarer for an example. A major outline of the cattle rarer is moulded and first pasted on the background while other overlays are used to show major and specific parts of the Fulani man which makes him different from other Nigerian men. These parts are emphasized in various colours for the major purpose of drawing the attention of the students to it. Such could be on the hat, the stick, the embroidered gown, the pair of trousers, the hairdo, etc.

The overlays are also used to highlight certain areas to create the impression of depth on the figure, all forms of curves and corners are made possible on the overlays with the help of fret saw.

The last part of the collage is the frame. One may doubt the instructional value of frame on a work of this type but there is no gain saying in the fact that the frame plays a prominently role as much as the other parts. The frame comes in various designs and types; some come in aluminum profiles, gold coated profiles and even in plastic and wood. The selection of the type

of frame to be used depends strictly on the designer and his purse. Whichever the case is, the framing is important for the following outlined reasons:

- It strengthens the work and makes it durable.
- It adds to the works aesthetic value.
- It limits the student's concentration to the major focus i.e. the design alone.
- It provides for easy display by hanging or placing on the display table.

The process and tools of production have been refined in the last two decades so much that it becomes difficult to refer to creative art in isolation of technology in education. In fact, educational technology and learning system cannot be divorced. According to Davies (1978) "a learning system can be defined as an organized combination of people, materials facilities, equipment and procedures which interact to achieve a goal" (p.10).

A closer look at the use of plastic in a learning system therefore, in its simple forms, starts from the pre-nursery age when virtually all toys which are mostly the aid for identification and recognition of objects starts in a play way methods while the sense of construction and mathematical understanding arises from the use of plastic made abacus, Jig-saw puzzles, counter beads and others. Olumorin (1994) also asserts that:

The use of plastic in production of educational technology gadgets cannot be over-emphasized. Video and audio machines, projectors and various kinds of software materials and hardware tools come in a wide range of plastic in cases and components. (p.16)

He stated further that currently, polyester charts, blackboard rulers, protractor and dividers made in plastics for the use of teachers in the classroom have become the order of the day. Above all, most of the modern lecture rooms are installed with plastic chairs and polyvinyl pen/chalk boards.

Ajayi-Dopemu (1988), while enumerating the guidelines for producing media materials placed clarity, legibility, simplicity, accuracy, durability, portability and manageability as of paramount importance. Taking into consideration the qualities of plastics, one may conclude that plastic leads to media that satisfy the guidelines. Plastic collage for the purpose of instruction reserves a positive implication on educational technology and the purpose it stands for. (To ease the process of teaching and learning).

Statement of the Problem

It has been discovered that educational technologists and teacher have over-burdened and exhausted ides on the use of material and teaching aids made out of cardboard, papers, textiles, wood and sheet metals for the production of instructional materials (Olumorin, 1994). In addition, Obayan (1982) opines that the standard of teaching is falling and not the standard of teachers i.e. teaching and learning resource need to be upgraded especially with our natural and human resources.

Furthermore, as a result of the several uses that have been found for plastic since its first commercial production success in 1868, which spreads across all spheres of human endeavour, it is difficult to imagine a contemporary society without plastic, thus, the use in area of learning and instruction should be underscored especially in junior secondary school where effective teaching aids are needed.

This research therefore, investigates the effects of plastic collage instructional material, packaged specially for junior secondary schools, considering the above mentioned reasons.

Research Hypotheses

Ho: There is no significant difference in the cognitive performance of students taught using cardboard and marker made instructional material and those taught using collage made from re-cycled plastic.

Methodology

This study is purposely geared towards the production and use of plastic collage as an instructional material for the effective teaching of any subject that may require concrete visual interpretation of abstract concepts. The study also examines the effectiveness of the use of the material over other products derived from wood, sheet metal, cardboard and the likes.

Two instructional materials were used, the first was an instructional material with ordinary drawing and painting of Nigerian traditional dresses on a cardboard with marker. The instructional material was critically assessed by Fine Art experts and found appropriate; this was used to teach the experimental group. The second instructional material was fabricated from re-cycled plastic with the same content as the first one (i.e. Nigerian Traditional Dresses). It was produced using locally available tools and equipment. The third instrument is a researcher made test based on the lesson taught with the instructional materials (the first and the second instruments).

The students were randomly selected into groups from the 4 schools by picking folded papers. The two groups (1 & 2) comprises of 40 students each i.e. twenty (ten girls and ten boys) from each of the four schools. In order to achieve the reliability of the research instruments, they were initially administered to 30 students who are not part of the samples. After an interval of two weeks, it was re-administered to the same respondents. The two scores were correlated using Pearson Product Moment Correlation Coefficient; the value obtained was 0.97 at 0.05 significant levels. This significant level was considered high enough, hence the instrument was considered reliable and suitable for this study. Two pre-test were given to the two groups at two weeks interval; after the first class. The students were asked to answer questions relating to identification of the major Nigerian Traditional Dresses, Scores obtained were used as pre-test. Again, the two groups were given the same instructions on the same content but this time, Group 1 was treated with an instructional aid of a painting on cardboard while Group 2 was treated to plastic instructional aid of the same content as painted on the cardboard used on group 1.

After the last treatment, the students were asked to identify the major Nigerian traditional dresses once again scores were taken, this is regarded as post test. Scores from both tests were statistically computed to determine the significance level.

Data Analysis

Analysis of covariance and t-test statistics were used to compute both pre-test and post-test scores.

Results

There is no significant difference in the cognitive performance of students taught using cardboard and marker made instructional material and those taught using collage made from re-cycled plastic. The first table (Table 1) indicated significance therefore, the hypothesis was rejected.

Table 1: Analysis of Covariance for the two groups used (Pre-test)

Source	SSW	df	MS	F
Main Effect	147.02	1	147.02	11.10
Explained	1608.01	2	402.08	30.50
Residual	991.00	77	14.01	

Table 1, with main effect F-ratio of 11.10 shows that there was significant difference in the performance of students in identifying the Nigerian Traditional Dresses in the two media used. The rejection of the hypothesis 1 indicates that it is not equal in the two means.

Table 2: t-test value on the mean scores of the 2 groups

Variables	N	Means	SD	t-value
Pretest 1	40	26.658	2.51	3.92
Pretest 1	40	28.14	2.39	
Pretest 2	40	26.21	2.54	6.93
Pretest 2	40	33.41	2.59	

Table 2 indicates a higher level of significance in group 2; it was the group to which the conventional cardboard instructional media was used. The t-value is 6.93 while that of group 1 on which the plastic instructional media was used is 3.92. The value of t is 2.02.

Finding

The hypothesis (Ho_1) results which predicted that there would be no significant difference in the cognitive performance of students in the 2 groups shows that there was significant difference i.e. the group treated to the plastic collage instructional package performed better. The F-ratio as computed for the 2 groups was 11.10. The t-value as computed to show the line of effectiveness in performances were 3.92 in favour of group 2 that were treated to plastic instructional package better inculcate learning cognitively than other conventional instructional packages made out of cardboards, wood and sheet metals.

Conclusion and Recommendations

The finding in this study however have established the efficiency of plastic instructional package over the conventional instructional materials in teaching basic cognitive based instruction, this can be seen in the example of the identification of Nigerian Traditional Dresses in Social Studies as experimented in the study.

It is therefore recommended that teachers should be encouraged to design and develop their own instructional materials using simple materials that are easy to fabricate and form such as plastic. When designing and producing, teachers should endeavour to involve educational technologist, instructional material experts, Education Resource Centers (ERC) and plastic fabricators should be used as resource fellows.

Federal and State Ministries of Education, National Educational Technology Centre (NETC) and Nigerian Association for Educational Media and Technology (NAEMT) are all advised to start the productions of plastic instructional packages for use in various schools subjects.

The syllabi and schemes of work should be closely examined before embarking on production to ensure validity of content. Finally, NAEMT should view the designing and production of instructional materials/packages generally as a challenge to be accomplished and an avenue to make her impact felt in teaching and learning activities in the school system. This will of course serve as means of revenue generation to the Association nationally and at State levels.

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